

The Diameter of the Asteroid Juno (3), determined with the Micrometer of the 40-inch Refractor of the Yerkes Observatory, with remarks on some of the other Asteroids. By E. E. Barnard.

During 1894 and 1895 I secured measures of the diameters of the four largest asteroids, *Ceres* (1), *Pallas* (2), *Juno* (3), and *Vesta* (4), with the 36-inch of the Lick Observatory (see *Monthly Notices* for December 1895, vol. lvi. p. 55).

At that time *Juno* was at the limit of measurement, and it was a question whether the diameter then obtained was the true one or whether it was simply the spurious disc, for measurements of stars of about the same magnitude as *Juno* gave results almost the same as those obtained for *Juno*.

On account of the large eccentricity of the orbit of this asteroid some oppositions are much more favourable than others. The opposition of 1894 (during which the diameter was measured) was not a favourable one.

It was hoped that in its nearer oppositions measures might be obtained which would leave no doubt of the size of the planet.

The opposition of 1896 was favourable, but the 40-inch was not yet ready for observations, and I have not heard of any measures being obtained elsewhere.

The present opposition of 1900 was a favourable one. A close watch was kept on the planet for opportunities to secure measures. It was looked at a number of times, but there were only five dates on which the disc could be seen for measurement. The diameter was carefully measured at these times, and the results are believed to be good. They verify in a satisfactory manner the measures of 1894.

In the present measures a magnifying power of 1340 diameters was used, and several times one of 1700 was also used.

When best seen, the disc was clear cut and round, with no discernible markings. The planet is yellowish in colour.

Diameter of Juno (3).

1900.	Observed.	At Δ 2.7673.
Sept. 13	0.26	0.11
19	0.23	0.10
29	0.23	0.10
Oct. 8	0.22	0.09
11	0.20	0.08
		0.096

At distance unity this becomes 0".266, which corresponds to a diameter of 120 miles.

The mean value is derived from results carried out to three decimal places.

The values $0''.095$ and $0''.263$ from the measures of 1894 are as closely in agreement with the above results as can be expected; this is specially pleasing after having waited six years for a chance to measure the planet again.

In *Monthly Notices* for 1900 January, vol. lx. p. 261, I have given some measures of *Ceres* (1) and *Vesta* (4), obtained with the 40-inch, which, though not made under as favourable conditions as the measures of 1894 and 1895, are in close agreement with those measures.

I will collect here, for convenience of reference, the results of all my measures of these four asteroids, combining the measures of *Ceres* and *Vesta* made with the 40-inch with those obtained with the 36-inch, but retaining only the measures of *Juno* made with the 40-inch, because of the unfavourable position of the planet in 1894.

These measures are, I believe, as fair a representation of the true diameters of these small bodies as it is possible for one observer to obtain. I have faith in their goodness.

	Δ 27673.	Δ 1.	In Miles.	
Ceres (1)	$0''.383$	$1''.060$	477	28 nights.
Pallas (2)	$0''.244$	$0''.675$	304	5 "
Juno (3)	$0''.096$	$0''.266$	120	5 "
Vesta (4)	$0''.192$	$0''.531$	239	21 "

For completeness I will repeat here from *Monthly Notices*, 1895 December, the values of the albedos which my measures, obtained in 1894 and 1895, give for these asteroids, assuming $Mars = 1.00$.

Albedos.

Ceres	0.67	Juno	1.67
Pallas	0.88	Vesta	2.77

Perhaps none of the other asteroids have diameters sufficiently large ever to come within the measuring power of our powerful telescopes. Their diameters therefore will have to be determined by the interference method which M. Maurice Hamy has shown, in the case of *Vesta*, gives identical results with those obtained with the micrometers of the great telescopes.

There is one other member, however, whose diameter will be readily determined under favourable conditions. *Eros* at its nearest approach should present a disc not far from a half-second in diameter, and this is an easily measurable quantity. This latter planet is of a yellowish colour in the great telescope.

In connection with these asteroid diameters I have also measured the diameters of all the planets and satellites measurable. These measures are collected in a paper in *Popular Astronomy* for 1897 October. The title of the paper is "A Micrometrical Determination of the Dimensions of the Planets and Satellites of the Solar System made with the 36-inch Refractor of the Lick Observatory."